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desert, are not considered. Most of these are known as recent shells also; but we think it would have been a useful addition to the collection if such extinct forms as Tryonia had been included.

To the catalogue in tabular form and the explanation of the plates are prefixed a statement of the object and method of the work, a *résumé* of the subject by zoological families, and some general considerations. In these last the author, we think, is the first to enunciate certain propositions, which, though simple, constitute an important advance over previous statements of the general topic. In brief, he points out the high probability that lacustrine, at first brackish-water forms, were derived from marine species by imprisonment due to rising seashores, forming, first estuaries, then lakes; afterward differentiated so as to become inured to water without salt, or, in other cases, exterminated by water too fresh, or in lakes without an outlet, by concentration of saline matters. This view is not wholly novel; but the author goes on to supplement it by pointing out how, from the gradual conversion of lakes into rivers, and the persistence of the latter through epochs of geological change, the remarkable persistency of fluviatile types is accounted for, and problems of present geographical distribution may be solved.

Too much space would be required for an analysis of the work in detail: a few points have been noted for mention. It seems a little startling to have oysters, Anomiae, and mussels presented as non-marine, until we learn that they were of the peculiar brackish-water beds in the Laramie group, and were doubtless accustomed to almost lacustrine conditions. The oldest forms treated of are Naiadites and certain supposed Anodontae from the Devonian (the latter much suggesting in appearance Lithodomus and its allies); but if these were not, as is supposed, true fresh-water folk, then the earliest of the latter date from the trias. Six families of Conchifera, in all, and sixteen of Gastropoda, are represented in the catalogue. It might be suggested that an analogue of Unio belliplicatus may, perhaps, be found living in Nicaragua, and that Cerithidea lives rather abundantly on the Californian coast.

The proof-reading of this volume is not up to the usual standard of the Government printing-office, and the index is disappointingly meagre. The arrangement of the numbers to figures on the plates is confused and puzzling: it can hardly fail to cause a serious loss of time to those who consult them. On the other hand, the paper and press-work are above the average, and the execution of the figures unusually good.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

GEODESY.

Geodetic night-signals.—Mr. C. O. Boutelle, of the U. S. coast-survey, finds that the magnesium light as used by the survey may be used for distances as great as forty-five to seventy miles, and that the ordinary student-lamp with a parabolic reflector may be seen as far as forty miles. A report on night-signals was published by the coast-survey last year. The advantages stated in the report, as derived from greater steadiness of the atmosphere, and comparative freedom from lateral refraction upon long lines of sight during night observations, have been signally verified during the seasons of 1881 and 1882.—(*Rep. U. S. coast geod. surv.*, 1880.) [859]

MATHEMATICS.

A definite integral.—In a brief note, M. Korkine gives a simple proof of a theorem due to M. Tchébychef. The theorem relates to the integral $\int_0^1 \phi(x) \psi(x) dx$, where ϕ and ψ must satisfy one of the two conditions: 1°, they simultaneously increase or simultaneously decrease for all values of x lying between zero and unity; 2°, or one of them must increase and the other decrease for the same values of x . In the first case, M. Tchébychef's theorem is

$$\int_0^1 \phi(x) \psi(x) dx > \int_0^1 \phi(x) dx \int_0^1 \psi(x) dx;$$

in the second case,

$$\int_0^1 \phi(x) \psi(x) dx < \int_0^1 \phi(x) dx \int_0^1 \psi(x) dx.$$

M. Korkine makes these theorems the immediate consequence of a simple identity.—(*Comptes rendus*, Jan. 29.) T. C. [860]

Linear differential equations.—In a previous communication to the academy, M. Goursat has solved, for a special class of equations, the problem to find the entire number of substitutions to which a system of fundamental integrals of a given equation may be subjected, corresponding to all the different closed paths which the variable may describe. The general integral in that case was shown to be expressed by hypergeometric series of higher orders. In the present paper, M. Goursat develops more fully his method, and applies it to the equation of the third order, remarking that the method followed is identically the same for equations of any order.—(*Comptes rendus*, Jan. 29.) T. C. [861]

Functions of two independent variables.—M. Picard has given a series of notes upon this subject, determining the functions of two independent variables, u and v , which remain invariable when we effect upon u and v any of the infinite number of substitutions of a linear discontinuous group. In the present paper M. Picard considers, in a general

manner, a discontinuous group for all points (u, v) of the region D, defined by

$$u'^2 + u''^2 + v'^2 + v''^2 < 1,$$

where

$$u = u' + iu'', \quad v = v' + iv''.$$

The author shows that every substitution of the group transforms each point of the limit of D into another point of the same limit. He also shows that there exist functions, F , of u and v , only defined in the region D, and which leave invariable all of the substitutions of the group. The only groups considered are those possessing this property: viz., we can always find in the region D a region R, having no point common with the limit of D, and such that, in the interior of R, there is one, and only one, point which corresponds to any point (u, v) by means of the substitutions of the group. — (*Comptes rendus*, Jan. 29.) T. C. [862]

Differential equations. — M. Steen treats certain differential equations of the second order, an account of which has already appeared in another place. The differential equations are of the form

$$y'' - (a \cot x - b \tan x) y' + cy = 0, \\ y' + (a \cot x - b \tan x) y + cy = 0;$$

x being the independent variable, and the accents denoting differential co-efficients. These equations are treated for special values of the constants a, b, c , and the integrals exhibited in the form of series of trigonometric functions, and also in the form of definite integrals of certain trigonometric functions. — (*Vidensk. selsk. skr.*, (6), *naturv. math. afd.*, i. 6.) T. C. [863]

PHYSICS.

Mechanics.

Radius of gyration of a rifled projectile. — Lieut. C. A. Stone deduces a formula for the determination of this value. Applied to the 700-lb. Butler shell, he obtains $K = 4.1224''$; while the bureau of ordnance, U.S.A., found by experiment for this shell, $K = 4.1005358''$. Lieut. Stone discusses, also, the ratio of the forces necessary to give translation and rotation to a rifled projectile, and the ratio of the ranges of a projectile measured on the horizontal and on an inclined plane in a non-resisting medium. — (*Proc. U. S. nav. inst.*, viii. no. 4.) C. E. M. [864]

Acoustics.

Hydrogen-whistles. — Mr. Francis Galton has continued his researches upon the production of notes of excessively high pitch, and their audibility to different animals, wishing to test the powers of insects in this respect. The idea has occurred to him of blowing his high-pitched whistle with hydrogen-gas, and so increasing its shrillness. Preliminary experiments with coal-gas have given good results; and Mr. Galton thinks that he can produce a sound due to 624,000 vibrations per second. — (*Nature*, March 22.) C. R. C. [865]

Intensity of sound. — Vierordt has studied the subject of the estimation of the intensity of sound by the process of dropping a body upon a sonorous plate. The intensity of the sound produced is proportional to h^e , where e is a co-efficient to be determined experimentally. A formula given by Oberbeck is,

$$e = \frac{\log \frac{P}{p}}{\log \frac{H}{h}},$$

if h is the height fallen through by the heavier weight P , and H the greater height fallen through by a

lighter weight p , when the intensity of the sound produced by striking the plate is the same. A large number of measurements are recorded, from which the author concludes that there is a general measure of the strength of sound. With spheres of the same material, and plates of definite material and weight, the value of e varies but slightly with increasing weight of the sphere, or with variation in the height of fall. — (*Ann. phys. chem.*, No. 3, 1883.) C. R. C. [866]

Optics.

(Photography.)

Astronomical photography. — At the Meudon (France) observatory they are studying movements of photospheric matter with the aid of series of images obtained with the 'photographic revolver.' They are also working at photographic photometry, the principle being, that the intensities of two light-sources are in the inverse ratio of the time they take for the same photographic work; e.g., producing the same tint on two quite similar plates. The method will be applied to data of the comet of 1881, the full moon, etc. — (*Nature*, March 15.) W. H. P. [867]

Astronomical photography. — At the March meeting of the Royal astronomical society, Dr. Gould gave an account of his work at Cordova. He considered that he had been successful in photographing stars down to the tenth and a half or twelfth magnitude. Mr. Common showed a photograph he had taken of the great nebula in Orion, the appearance of which, in many parts, gave rise to an interesting discussion; the majority of those taking part inclining to the belief that the photograph represented certain unknown dark objects in space. — (*Brit. journ. phot.*, March 23.)

[No such appearance has been noted here in the excellent photographs of this object taken by the late Dr. Henry Draper.] — W. H. P. [868]

Positive prints from a positive. — MM. Cros and Vergeraud have sent to the French photographic society a communication on the above subject. A suitable paper is covered with a solution of ammonium bichromate, 2 grams; glucose, 15 grams; water, 100 grams. This is dried, and exposed to the light under a positive. When the uncovered portions of the paper, which were at first of a decided yellow, have become gray, the exposure is discontinued, and a rapid immersion made in a silver bath, composed as follows: silver nitrate, 1 gram; acetic acid, 10 grams; water, 100 grams. The image appears immediately of a blood-red color, formed by the bichromate of silver. In all parts where the light has acted, the bichromate has been reduced by the glucose; and, where the variable opacities of the image have protected in different degrees the sensitive film, the bichromate of silver remains insoluble in the water of the subsequent washing. If dried by fire, the image remains red; if dried in the open air and in the light, especially in the sun, it becomes dark brown. To obtain a black image, it suffices to expose the dry prints to sulphurous-acid gas. A bath of sulphite of copper and potash in solution gives a more intense black. — (*Philad. phot.*, April.) W. H. P. [869]

Electricity.

Electro-optical properties of quartz. — W. C. Röntgen confirms and extends results obtained in a former paper (*Ann. phys. chem.*, no. 3). The specimens used were a thick circular plate, cut perpendicular to the principal axis of the crystal, and a sphere. The apparatus for investigating the quartz-sphere was an old microscope. The quartz was laid on the

object-stand, and the weighted microscope-tube let down upon it. There are three planes through the principal axis, making angles of 120° with each other, such that all pressures in these planes, or parallel to them, produce minimum electricity at the points of pressure. Pressure exerted perpendicular to these minimum planes produces maximum electricity. Each of the six fields into which the minimum planes divide the sphere possesses the property that all points of pressure within it are electrified to the same sign: these signs are opposite in adjacent fields. Pressure in the direction of the principal axis gives each of the six fields its peculiar sign: pressure in any other direction divides the sphere into two oppositely electrified halves, the plane of division passing through the principal axis. No direction of pressure produces electricity at the ends of the principal axis. If the direction of pressure is a maximum axis, the plane of division is the minimum plane perpendicular to it (the signs of the halves correspond to the signs of the fields in which the maximum axis lies); but, if the pressure is in this minimum plane, the electrification is exactly reversed. The experiments seem to show, that, if the direction of pressure rotates about the principal axis with an angular velocity ω , the plane of division rotates in the opposite direction with a velocity 2ω . The author then shows that the optical properties of quartz in an electric field can be accounted for by the expansions and contractions which quartz undergoes under electrical strain, according to the principle of reversibility of piezoelectric effects pointed out by Lippmann. This result has also been reached independently by Kundt in *Ann. phys. chem.*, no. 3. — (*Ann. phys. chem.*, no. 4.) J. T. [870]

Corrosion of steel.—Two chisels in the channel-way of the U.S.S. Triana were badly corroded. Prof. Munroe, U.S. N.A. finds this due to electro-chemical action between tempered and untempered steel in presence of salt water. The untempered steel suffered. — (*Proc. U. S. nav. inst.*, viii. no. 3.) C. E. M. [871]

ENGINEERING.

Tensions in guns.—Considering the longitudinal and hoop tensions in a thick hollow cylinder, Lieut. Stone, U.S.N., finds that the longitudinal tension is greatest on the outside, and the hoop tension is greatest on the inside, where an assumed distance of a point from the axis of the cylinder coincides with the internal radius. He shows the presence of a neutral surface, within which there is a longitudinal compression, and without, a longitudinal tension. The formula deduced, giving the value of the maximum hoop tension, differs considerably from that heretofore used. The existence of a neutral surface of longitudinal stress is of great interest in the construction of built-up guns. That a longitudinal contraction may accompany a circumferential expansion is a familiar result of experiment. These formulas may be used in calculating the tensions in built-up wire guns. — (*Proc. U. S. nav. inst.*, viii. no. 3.) C. E. M. [872]

Lighting buoys and railroad-cars.—The U. S. lighthouse board has placed a Pintsch lighted buoy at the entrance of New-York harbor at the request of the pilot commissioners. The Erie and the West Shore railroads have adopted this method of lighting cars in imitation of German railways. Gas made from coal-oil is stored by compression in reservoirs, and burned in peculiar burners, a regulator being used to preserve the desired pressure. — (*Marine reg.*, *R. R. gaz.*, April.) R. H. T. [873]

Heavy steel guns.—The chief of ordnance has called for information from the steel-makers of the United States, relative to the feasibility of making steel for ordnance, giving analyses of desired qualities. The act of 1883 provides for arming fortifications with steel guns. — (*Bull. iron steel assoc.*, April, 1883.) R. H. T. [874]

Standard gauge system.—G. M. Bond, M.E., has described to the American society of mechanical engineers the system of standardizing gauges devised by Prof. Rogers of Harvard, and himself, for the Pratt & Whitney company of Hartford, and the comparator built for that company under their direction for establishing standard gauge measures. A pair of standard inch-measures, worked down independently, were found to be exactly alike, the difference, if any exists, being less than $\frac{1}{100000}$ inch. Bond reports ready for inspection by the committee of the society, a set of end-measures varying by sixteenths of an inch, and a complete plant of tools and fixtures for producing standards, duplicating originals by machined work. — (*Journ. Frankl. inst.*, May.) R. H. T. [875]

CHEMISTRY.

(Analytical.)

Estimation of sulphur in organic bodies.—P. Claësson has perfected a method for the determination of sulphur in organic substances, which seems, from his results, to be capable of remedying the various defects that detract to a greater or less extent from the accuracy of the methods hitherto in use. It consists in burning the substance in a current of nitric dioxide and oxygen, and absorbing the sulphuric acid in a receiver containing water. The sulphuric acid may be determined by titration, or by precipitation as baric sulphate. The substance is placed in an ordinary combustion-tube, and behind it a roll of platinized asbestos. In front of the substance are placed several platinized asbestos rolls, and a small tube containing fuming nitric acid. The combustion is conducted in the usual way, and finally the sulphuric acid as well as the nitric acid is expelled into the receiver. The author adduces results to show that a dilute solution of sulphuric acid may be evaporated to dryness on the water-bath without appreciable loss of the acid. — (*Zeitschr. anal. chem.*, xxii. 182.) C. F. M. [876]

Determination of lactic acid.—R. Palm states that lactic acid is completely precipitated when it is added in aqueous solution to an alcoholic ammoniacal solution of basic plumbic acetate. The plumbic lactate is washed with alcohol, since it is somewhat soluble in water. — (*Zeitschr. anal. chem.*, xxii. 223.) C. F. M. [877]

Flow of liquids on the surface of a burette.—In measuring liquids from a burette, Prof. R. B. Warder finds that an error may be introduced by the gradual rise of the meniscus, if the reading is taken too soon after the flow of the liquid is stopped. After a discharge of 60 cc. of a one-eighth normal solution of sodic hydrate, the meniscus continued to rise for ten minutes. — (*Proc. Ohio mech. inst.*, ii. 46.) C. F. M. [878]

A new method for the determination of arsenic.—Mr. Richard Pearce, of the Boston and Colorado smelting company, described a method for the quantitative estimation of arsenic, as suggested by himself, and developed by Albert H. Low, chemist of the company. It consists in first fusing the mineral, ore, or furnace-product supposed to contain arsenic, with sodium carbonate and potassium nitrate, ex-

tracting the soluble arseniate with water, acidulating the solution with nitric acid, boiling to expel carbon dioxide, neutralizing carefully with ammonia (the reaction should be faintly alkaline rather than acid), and precipitating the arsenic in the cold with argentic nitrate as the brick-red salt Ag_3AsO_4 . The latter is thrown on a filter, washed well, dissolved in nitric acid, and the silver determined by titration with ammonium or potassium sulpho-cyanate, whence the arsenic can readily be calculated. The results communicated showed very remarkable concordance, and apparently a high degree of accuracy. The exact degree of accuracy does not appear; since the percentage of arsenic in some of the substances tested was not determined gravimetrically, but assumed to be that required by theory. By this method, 0.1 gr. of enargite yielded 19.03 and 19.09 % arsenic in successive trials. 0.05 gr. pure proustite gave 15.08 % arsenic, while 15.15 % is theoretically required. An ore mixture gave respectively, 3.26, 3.30, 3.19, and 3.25 % arsenic in different trials. A copper matte yielded 0.47 and 0.46 % arsenic in successive determinations. Antimony, the presence of which in solution would vitiate the results of analysis, is almost entirely excluded by the use of sodium carbonate in the fusion. In a mixture of the enargite above tested with stibnite, 19.13 % arsenic was found. No experiments were made to test the solvent action of the ammonium nitrate in the solution on the argentic arseniate. The advantages claimed for the method are the great ease and rapidity with which a determination can be made, and the high degree of accuracy attainable, fully sufficient, at least, for technical purposes. — (*Col. soc. soc. ; meeting Feb. 5.*) [879]

AGRICULTURE.

Action of peat on insoluble phosphates.—In an extensive series of experiments carried out at the Moor experiment-station in Bremen, Fleischer finds that certain peats exert a very considerable solvent action on phosphates. The first experiments were made in the laboratory by intimately mixing finely ground peat and phosphate, adding water, and allowing the mixture to stand, usually for three days. Peat from the lowland moors showed no solvent action; but that from highland moors (sphagnum peat) acted upon the phosphates in every case but two, dissolving from three or four to over fifty per cent of the phosphoric acid present, according to the nature of the phosphatic material. The materials used may be arranged in about the following order, the more soluble first: pure dicalcic phosphate, precipitated tricalcic phosphate, fine raw bone, steamed bone, commercial precipitated phosphates, bone-ash, crude Mejillones guano, Lahn phosphate. The action appears to be due to the presence of free humic acid, which decomposes the phosphates. In several cases the action went so far as to produce free phosphoric acid. Addition of potash-salts was found to increase the solvent action. These results are entirely in harmony with those that have been obtained in field-experiments on these soils. Almost invariably, insoluble phosphates have given better results than soluble ones, the reason evidently being, that, owing to the small absorptive power of peat, the soluble phosphates are soon washed out of the soil, while the insoluble phosphates yield up their phosphoric acid so slowly that the plants can utilize most or all of it. Experiments were also made in composting phosphates and peat. Here, also, phosphoric acid was dissolved, but not to so great an extent as in the laboratory experiments, where a much more intimate

mixture of the materials was possible. From 0.6 to 9.2 per cent of the total phosphoric acid was dissolved. Potash salts increased the solubility of the phosphates. A large proportion of the phosphoric acid was rendered soluble in ammonium citrate; that is, brought into a condition similar to that of the so-called reverted phosphoric acid. In connection with these experiments, Kissling has studied the effect of the presence of various salts on the action of peat upon phosphates. Potassium sulphate increased the action decidedly, potassium chloride to a less degree, and sodium nitrate and kainit hardly at all. Gypsum and calcium chloride decreased the solvent action, and potassium carbonate destroyed it altogether, presumably by neutralizing the humic acid of the peat. The effect of the potassium sulphate was found to be almost exactly in proportion to the quantity used. Although the solvent action of peat, and of peat and potash salts, appears to be comparatively slight on the large scale, it is not without importance; since, in the soil, it may continue for a long time, and the products of the reaction may be continually removed by the movements of water in the soil and the action of vegetation. Fleischer found, that, after his mixtures of peat and phosphates were washed out, the action appeared to begin afresh; and something very like this must occur in the soil. — (*Landw. Jahrb.*, xii. 129, 193.) H. P. A. [880]

GEOLOGY.

The Bow and Belly River districts, North-West territory.—The rocks of the foot-hills and east of the mountains, according to G. M. Dawson, are entirely of cretaceous and Laramie age, overlain by boulder clay and other beds referable to the glacial epoch. The geology of the region is complicated by the fact, that, in the immediate vicinity of the mountains the beds change considerably in lithological character, the change being such as would be expected to occur on the approach to a shore-line. So far, no reason has been found to suppose that any beds newer than the Laramie (including under this general name the Judith River and Fort Union series) have been found in this district, or, indeed, in any part of the Canadian North-West territory. The general arrangement of the rocks is given in the following table:—

I. Laramie (including Judith River series).—1. Beds of the Porcupine Hills: massive sandstones, with shales, etc. 2. Willow Creek beds: reddish and purplish clays, with gray and yellowish sandstones. 3. St. Mary River series: sandstone shales and clays of general grayish or grayish-green colors. 4. Yellowish sandstones and shaly beds, with a mingling of fresh-water and brackish or marine mollusks.

II. Fore Hills.—1. Yellowish sandstones, with some shales, apparently irregular in thickness and character; mollusks all marine.

III. Pierre group.—1. Blackish and lead-colored shales, with occasional sandstone intercalations, especially toward the mountains.

IV. Niobrara?—Belly River series: sandstones, shales, and sandy clays. Upper part generally grayish; lower, yellowish, and often banded by rapidly alternating beds. Fresh and brackish water mollusks.

Near its base, the Laramie of this region is a persistent lignite or coal-bearing formation. In the Pierre group, the most persistent coal-bearing horizon is at its base, although there is a coal-seam at its summit on Bow River. Mr. Dawson considers the coal-bearing horizon at the base of the Pierre to be nearly equivalent to that at the base of the Chico group, which yields the coals of Vancouver Island at Nanaimo and Comox. (In this connection it is well to remember that the identity of the so-called Chico of Vancouver Island with the group of that name in

California is not by any means established.) The following approximate estimates of the quantity of coal underlying one square mile of country in several localities have been made:—

Main seam, in vicinity of Coal Banks, Belly River, 5,500,000 tons.

Grassy Island, Bow River (continuation of Belly River, main seam), 5,000,000 tons.

Horse-shoe Bend, Bow River, 4,900,000 tons.

Blackfoot Crossing, workable coal in seam as exposed on Bow River, 9,000,000 tons. — (*Geol. surv. Can.*) J. B. M. [881]

Triassic traps and sandstones.—Mr. W. M. Davis last summer visited a number of localities in Massachusetts, Connecticut, and New Jersey, for the purpose of studying the relation of the trap masses to the triassic sandstones and shales. Some of these are dikes traversing the strata at high angles, and about such there has been comparatively little conflict of opinion. But the greater number exist as sheets conforming to the bedding; and these have been regarded by some writers as contemporaneous, by others as intrusive. Mr. Davis finds distinct evidence that some of the sheets were extravasated during the deposition of the strata, being afterward buried as the sedimentation progressed; and he finds equally distinct evidence that other sheets were injected between sedimentary layers already formed, and cooled under pressure. To the first class belong the principal masses of the Connecticut valley, including Deerfield Mountain, Mounts Tom and Holyoke, and the Hanging Hills near Meriden; to the second, belong the East and West Rocks near New Haven, and the Palisades of the Hudson. The principal intrusive masses occur in what are regarded as the lower portions of the formation, and may have been injected while the upper strata were still in process of formation.

A duplication of trap-ridges by faulting is demonstrated in some instances, and suspected in others; and it is pointed out that these faults may belong to a wide system, whose total effect is greatly to expand the outcrop of the formation by duplication. Each of the greater triassic districts presents a wide expanse of strata, with a prevailing dip at a considerable angle in one direction. To account for the phenomena by tilting alone, assumes an amount of deposition and subsequent erosion appalling even to the geologist; while the erosion demanded by the hypothesis of tilting and faulting combined is readily admissible.

The observations are prefaced by a bibliography of the subject, and followed by a general discussion, which includes an excellent digest of the opinions and observations of earlier writers. The paper makes a pamphlet of sixty octavo pages, illustrated by three plates. — (*Bull. mus. comp. zool., geol. ser.*, i., no. ix.) G. K. G. [882]

Ore-deposition by replacement.—As a result of his geological studies in Leadville, Col., Mr. S. F. Emmons has reached the conclusion that the 'carbonate deposits' of that locality were not formed by the filling of pre-existent cavities. They belong to a class of deposits for which he proposes the name *metamorphic*, and which are produced by a metasomatic interchange between exotic matter and original rock material. In Leadville the original rock is a dolomitic limestone, 150 to 200 feet thick; and the replacement has occurred either at or near its contact with an overlying sheet of porphyry. The introduced or vein material consists of silica and metallic minerals. These were brought in solution by percolating waters, having been previously dissolved from the

associated eruptive rocks. In places the whole bed of limestone has been replaced, but in general only a portion. The equivalent vein occupies less space than the limestone; but, allowing for this difference, the thickness of vein and the thickness of residual limestone are complementary.

Mr. Emmons regards the class of metamorphic deposits as an extensive one, including a large proportion of the so-called fissure-veins, both calcareous and siliceous, of the Rocky Mountain region. — (*Phil. soc. Wash.*; meeting April 7). [883]

MINERALOGY.

Products of the alteration of corundum.—The following are the results of observations made by F. A. Genth:—

Alteration into spinel.—At the Charter mine, Madison County, N.C., corundum occurs crystallized, and in cleavage masses of a grayish or white color. In the cracks of the same it can be noticed that a change has taken place; and in many cases this extends through large masses, converting the corundum into a massive greenish-black spinel, rarely showing octahedral crystals. The same has a gravity of 3.751. Scales of prochlorite, into which the mineral finally passes, are often present. Analysis of the carefully selected material indicates that it has the composition of a spinel.

Alteration into zoisite.—At Towns County, Ga., pink crystals of corundum are found, surrounded by greenish-white cleavable zoisite.

Alteration into feldspar and mica.—The author cites many occurrences in which cleavable masses of oligoclase and albite surround a core of undecomposed corundum, also where the corundum is surrounded by flat, cleavable mica (muscovite) or a delicate fibrous mica (damourite). Sometimes the mica and feldspar occur together; and the nucleus of undecomposed corundum appears on its exterior very rough, as if it had been eaten into. Numerous analyses are given to prove the identity of the decomposition products.

Alteration into margarite.—This occurs more seldom than the alteration into potash mica; and in some cases scales of the latter are interposed between the margarite, which usually is compact in its nature. Specimens showing this alteration are from Jackson and Iredell counties, N.C., and from Unionville and Aston township, Penn.

Alteration into fibrolite.—Specimens from near Norwich, Conn., and Burke county, N.C., show radiated fibrolite surrounding crystals of unaltered corundum. It seems as if, in many cases, the fibrolite had undergone a subsequent change into mica.

Alteration into cyanite.—At Iredell and Wilkes counties, N.C., bladed cyanite is found surrounding, and evidently resulting from, the alteration of corundum. From the latter locality the cyanite has partially undergone a change into micaceous minerals. — (*Proc. Amer. phil. soc. Philad.*, xx. 381.) S. L. P. [884]

GEOGRAPHY.

(*Arctic.*)

Geographical notes from the north.—The record of the Eira expedition appears in the *Monthly record of geography* for April, giving an account of the voyage up to Aug. 21, 1881, when the vessel was pierced by the ice, and the subsequent proceedings of the party until their rescue during the following summer. Even during the arctic winter, warm southerly gales occurred, which resulted in limited areas of open water. — Prof. Nordenskiöld's expedition will

sail some time during May, and will attempt a journey eastward over the ice from Auleitsvik fiord, in lat. $68^{\circ} 30'$, near Egedesminde. Later an attempt may be made to penetrate northward along the south-eastern coast. — No new information has been obtained from the remainder of the Jeannette survivors, recently examined by the Naval board. — In a recent lecture, Mr. E. H. Hall stated that the population of Newfoundland and Labrador amounts to 190,000, about one-quarter of whom subsist by the fisheries, which are valued at four and a half millions of dollars annually. The copper-mines produce about 45,000 tons of metal annually. — A hurricane in British Columbia recently destroyed four vessels in Victoria harbor, and was attended with some loss of life. — The fur-seal fishery off Cape Flattery has been very productive this season, over 20,000 seals having been secured. — The Newfoundland hair-seal fishery has also been remarkably successful, more than 200,000 hooded and harp seal being reported taken. On the other hand, the Dundee fleet, in the same waters, is said to have made a poor catch. — Ensign Stoney, U.S.N., will sail early in May in the revenue-cutter Corwin to distribute the presents from the government to the Chukchis, of St. Lawrence Bay, Bering Strait, who succored the crew of the U.S.S. Rodgers, which was burned in that bay while searching for the Jeannette party. — The growing scarcity of salmon for canning, in the Columbia River and southward, has led those interested to push into the undeveloped waters northward. Several new fisheries have been established on the Skeena River, and others on the Chilkat River, and even in Cook's Inlet, nearly to latitude 60° N. — Four steam-whalers, built on the Pacific coast, will join the Bering Strait fleet this season. They are fitted with all the latest improvements, including iron tanks for oil and blubber, and are appropriately named the Orca, Bowhead, Narwhal, and Balaena. — It has been a very open season in Alaska, and in the south-eastern portion the snow was reported nearly gone March 25. — The aboriginal inhabitants of middle and northern Siberia, especially the Ostiaks and Samoyeds, are apparently either at a standstill, or even decreasing in numbers. According to recent investigations of Yadrintseff, their situation is precarious; and that they should gradually die out, as seems inevitable, is the more unfortunate, since many of them possess much intelligence and numerous good qualities. — In *Petermann's Mittheilungen* for April, Dr. Rink describes the investigations of the Danes in Greenland during recent years, in mineralogy, geology, geography, botany, and archeology, and gives a geological map of the west coast between Disco and Pröven. — W. H. D. [885]

(South America.)

Chilian province Arauco. — A physical sketch of this province, by J. Sieveking, divides it into the littoral slope, the coast or Nahuelbuta range, the central plain, and the great Cordillera. The Nahuelbuta range extends north-north-west to south-south-east, and reaches an elevation of 5,000 feet. Its rocks are granite and crystalline schists, broken by basalt eruptions, and furnish gold to the streams. The auriferous gravels gave a rich yield to the early Spaniards, who forced the Indians to work them; but the latter rebelled, and drove away their would-be masters. In late years gold-washing has been again attempted with moderate success. Between the mountains and the coast is a hilly country, some twenty miles wide, rising to 1,000 feet elevation. It consists of Jurassic and later conglomerates and sandstones, which enclose valuable coal-beds, three to nine feet thick, with

a low percentage (two and a half) of ash. In Arauco little mining-work has yet been done: but, in the adjoining province on the north, the output reaches 10,000 tons a month; and with the rapid increase of steam-navigation along the western coast, of railroads in the interior, and of smelting and saltpetre works in the north, where fuel is scarce, this product must grow rapidly. The author believes the coal to be Jurassic, and not tertiary, as it has been described. All the coast range and littoral slope are heavily wooded, the climate rough and wet, especially in winter; the streams are short and not navigable, and, on nearing the coast, they cross a low plain of recent elevation. The harbors are open to the north-west, but closed on the south-west by the extension of sand-bars built up by the heavy waves and strong northward current. The central plain proves well adapted to agriculture and grazing at the few points where it has been settled; but the greater part is still unoccupied, except by the Araucanians, who maintain possession of a considerable share of good land in the south. Little is known of the Cordillera (it has hardly been entered), as winter begins early there with heavy snow-storms. The stones brought down by its streams are nearly all porphyritic, and sedimentary rocks are quite absent. There are two volcanoes on the range, — Antuco, which Pöppig found active; and Villarica, near the lake of the same name. — (*Peterm. Mitth.*, 1883, 57.) W. M. D. [886]

(Africa.)

Lake Moeris. — Another of the stories of Herodotus seems to be gaining ground. In 1871 Rousseau-Bey found, by levelling, that the present lake, Birket-el-Kerun, in the Fayum (cf. Schweinfurth, *Zeitschr. f. Erdk. Berlin*, xv. 1880, 152, map), is at surface and bottom 41 and 55 met. respectively below the Mediterranean, and that its former level was 10 met. above the same datum, giving an original depth of 65 met. and a greatly extended area. Comparing this with the description of the 'Meridis lacus,' given by Herodotus, Mr. F. C. Whitehouse was confirmed in his trust of the old geographer, and, after some preliminary excursions, set out from Cairo early in 1882, and succeeded in finding by aneroid measurement a considerable depression south of Birket-el-Kerun, with its lowest point 180 feet below the Mediterranean, separated from the northern basin by a low divide (gisr), that seemed decidedly below the level of the Nile in this latitude. The southern end of this depression was not visited; but, as now mapped, the entire basin, if flooded from the Nile, might approach the area, and reach the depth, given for it by Herodotus, although his description has generally been discredited, along with his assertion that it is 'manifestly artificial.' But this, also, Mr. Whitehouse seems to accept, as he speaks of the basin as a 'victory of mind over matter,' and suggests that we should treat the Mississippi as the Egyptians did the Nile. This conclusion, and the severely critical animus shown towards earlier writers, are the less satisfactory parts of the paper, which, in its evidence of work, its review of the cartography of the Fayum, and its quotations concerning Lake Moeris from ancient authors, contains much of interest. — (*Bull. Amer. geogr. soc.*, 1882, 85, map.) W. M. D. [887]

Southern Abyssinia. — P. Soleillet writes from Ankober, Nov. 10, 1882, that he had made good progress, and obtained from King Menelik valuable concessions for the commercial company that he represents. A vast agricultural territory was open to their occupation and cultivation. Olive-forests were found to be very extensive: their fruit might be

improved by grafting, and the company was conceded half of the yield for the next twenty-five years. Permission was given to lay a narrow-gauge railroad from Obok, at the head of the Gulf of Aden, past lake Aussa, to Shoa, following up the left bank of the 'Ouache' (Hawash), where the construction would be easy and cheap. — (*Comptes rendus soc. geogr. Paris*, 1883, 36.) (The road projected would be at least two hundred miles long, and partly in a very unproductive country; so that, in spite of the present activity of African development, this project can hardly expect an early completion.) — W. M. D. [888]

(*Atlantic Ocean.*)

The Faraday Hills. — Dr. O. Krümmel has discussed the Atlantic soundings published by the Siemens Brothers (see 439), and shows that the Faraday Hills (about lat. 50° N., long. 30° W.) are very probably formed by submarine volcanic eruption. The soundings are so numerous and exact, that a trustworthy profile across the hills is constructed, exhibiting their surprisingly steep slopes (13 to 17° on one side, and 35 to 25° on the other), and revealing them as a mass about six miles broad at the base, rising from a bottom 1,300 to 1,700 fathoms deep to a summit about a mile broad in a minimum depth of 630 fathoms. Their form is therefore truly volcanic, and their altitude approaches six thousand feet. They are of rocky or stony surface, and have no ooze characteristic of deep-sea bottoms. The Flemish cape on the eastern slope of the Newfoundland banks is also stony, but this is regarded as a deposit of drift from melting icebergs. — (*Ann. hydrog.*, 1883, 5, 146.) W. M. D. [889]

The Triton in the North Atlantic. — A sounding expedition on the British steamer Triton, under direction of Mr. Murray, formerly geologist on the Challenger, spent about a month in August and September last in exploring the Atlantic from the Shetland to the Faroe Islands, where, according to previous explorations, a shallowing of the bottom, named the 'Wyville-Thomson ridge,' separated the deep cold water on the north at 32° F. from the warmer bottom-water on the south at 47° F. In the northern part of the ridge, a depression was found with a depth a little over three hundred fathoms, through which some of the arctic water may pass southward. The shallower parts of the ridge, with a minimum depth of two hundred and sixty fathoms, is covered only with gravel and stones, and some of the latter showed distinct traces of glacial action. The fragments are of sandstone, diorite, mica-schist, gneiss, limestone, etc. Several new species were added to the faunae of the warm and cold areas first described in the results of the Lightning and Porcupine expeditions in 1868, 1869. — (*Ann. hydrog.*, 1883, 194.) W. M. D., [890]

BOTANY.

(*Physiological.*)

Extravasation of water from leaves. — This interesting phenomenon has been carefully examined by Volkens, who, while adding little that is really new, has shown the relations of the water-pores to the underlying tissues in a large number of families. It may be said, that, with three exceptions, the points of secretion were confined, in all cases examined, to the upper side of the leaf. The places are always distinguished by color, swelling, or some equally well-marked indication. The number of the pores is typical in many families and sections. — (*Jahrb. bot. gart. Berlin*, 1883, 167.) G. L. G. [891]

Continuity of protoplasm in contiguous cells. — Hillhouse's method is a modification of Sachs's, and consists in using dilute sulphuric acid on thin sections, following this by concentrated acid for several hours, thoroughly washing with water, and finally staining with ammonia-carmin. By this means it is possible to break down cell-wall without disturbing the protoplasmic threads. A similar process was used by Gardiner in his study of *Mimosa*. — (*Bot. centralbl.*, xvi. 1883.) G. L. G. [892]

Variable dichogamy. — Though as a general rule the Indian corn (*Zea*) appears to be imperfectly protandrous, — beginning to shed its pollen one or more days before the stigmas of the same plant are developed, but continuing the process for several days afterward, — in no small number of instances the dichogamy is reversed, so that the plant is strongly protogynous, while it is sometimes synœmic, — staminate and pistillate flowers maturing at the same time. This, with the similar behavior of the perfect flowers of certain species of *Ribes*, notably the golden currant, shows pretty clearly how either sort of dichogamy may have originated in what were at first synœmic species. — (*Rural New-Yorker*, April 14.) W. T. [893]

Self-impotence of red clover. — For six years Prof. Beal has been experimenting on the fruitfulness of *Trifolium pratense*, when self-pollinated and when crossed by humble-bees. Though the results obtained in the several years differ greatly, — from absolute self-sterility to the production of two-thirds as many seeds as by crossing, — they agree in showing a marked increase of seed where bees have worked. A source of error which tends to diminish the apparent value of crossing is the impossibility of excluding species of Thrips and other small insects by means of the netting used to cover the plants for the exclusion of bees, so that it is probable the degree of self-impotence is greater than appears from these experiments. The general results may be gathered from the appended table of ratios: —

	Bees excluded.	Bees admitted.
First year	66.6	100
Second year	63.5	100
Third year	{ First crop, 1.3 Second " 0.0	100 100 (0:337).
Fourth year	Not counted accurately	(0: many).
Fifth year	1.2	100
Sixth year	27.2	100
Average	26.6	100

— (*Rep. bot., Mich. agric. coll.*, 1881-82; *Amer. agric.*, Jan.) W. T. [894]

(*Systematic.*)

Flora of Madagascar. — The most important novelties among the Polypetalae of recent English collections in Madagascar are described by Mr. J. G. Baker, including about 135 species. The woody character of the vegetation is remarkable, as shown by this list, in which are 40 trees, and 64 shrubs and woody climbers, against 31 mainly herbaceous perennials and annuals. — (*Journ. Linn. soc. Lond.*, March, 1883.) S. W. [895]

New Bermuda plants. — The flora of the Bermudas, like that of the Azores, is remarkable for the almost complete absence of endemic species. With the exception, perhaps, of the palms, as yet imperfectly known, the only peculiar plants are two that have been recently described by Mr. Hemsley, and

these may yet be found to occur in the West Indies, or on the mainland. One is *Erigeron Darrellianus*, with the habit and foliage of *Conyza rivularis*; the other, *Statice Lefroyi*, hitherto identified as *S. Caroliniana*. — (*Journ. bot.*, April, 1883.) s. w. [896]

ZOOLOGY.

Mollusks.

The position of Rhodope. — The views of Graff (*Morph. jahrb.*, viii. i.), referring Rhodope to the nudibranchiate mollusks, have received such wide publicity that it is well, even if a little late, that the views on this topic of the most eminent living student of the nudibranchs should have a hearing. R. Bergh of Copenhagen has examined Rhodope with special reference to the views of Graff, and finds, notwithstanding the fact that it is separated by marked characters from the ordinary turbellarians, that the differences between it and the nudibranchiate gastropod mollusks are much greater. There are no nudibranchs destitute of a heart, or of an organ filling the office of a kidney. Few have the liver reduced to a single mass. The genital organs of Rhodope do not differ greatly from those of turbellarians. The form and armature of the tail resemble those of many turbellarians, and nothing similar is known among the nudibranchs. Certain resemblances assumed to exist between the nervous system in Rhodope and Tethys, on the basis of Ihering's figure of the latter, have no force, since it appears that the figure is inaccurate. Lastly, a quietus is placed upon the theory by the fact that the larva of Rhodope has neither larval shell nor velum, which are universal in nudibranchs. It is therefore certain that Rhodope is no nudibranch, and eminently probable that it is nothing more than a peculiarly aberrant turbellarian. — (*Zool. anz.*, 123.) w. h. d. [897]

Fischer's Manuel de conchyliologie. — Part fifth of this excellent work is at hand, comprising pp. 417-512, which carry it forward from the Ascorceratidae, concluding the Cephalopods, through the Pteropods, and nearly through the order Pulmonata in the class of Gastropoda. The latter is divided as follows: —

Class GASTROPODA.

	Class GASTROPODA.	
Subclass UNIVALVIA	{ Androgyna	{ Order Pulmonata.
	{ Dioica	{ Opisthobranchiata.
Subclass MULTIVALVIA		{ Heteropoda Nucleobranchiata.
		{ Platypoda Prosobranchiata.
	 Polyplocophora.

The author's paleontological researches have enabled him to preserve a satisfactory equilibrium as regards living and extinct forms. Numerous new and characteristic figures appear in the text, in addition to others not unfamiliar in the pages of Woodward; and with this fasciculus is added an atlas of twenty-four plates, which originally appeared in Woodward's Manual, and are well known, but which have never been excelled in clearness and accuracy by any purely black and white conchological plates issued up to the present time. The most casual inspection of the text, however, will show that we are presented with something quite different from a merely revised edition of Woodward, and that the volume when completed, though doubtless open to criticism in some of its details, will be by far the best text-book of the subject available. — w. h. d. [898]

Anatomy of Parmacella. — H. Simroth devotes a paper of forty-six pages, with an excellent plate, to the elucidation of the anatomy of *P. Olivieri* Cuvier. Its features are compared in detail with homologous organs in other pulmonates; and among his deductions the author concludes that the slugs constitute

the highest evolution-product of the group of Pulmonata (a view in which he was long preceded by A. A. Gould and others), and that Parmacella, in particular, exhibits closer relations with the Patula-section of Helicidae than with the group including Vitrina, etc., with which some other slugs are most closely allied. — (*Jahrb. deutsch. mal. gesellsch.*, i. 1883.) w. h. d. [899]

Curious slug from Madagascar. — Heynemann describes under the name of *Elisa bella* a curious slug allied to *Amalia*, with a spatulate internal shell, dorsal keel, four retractile tentacles, a jaw resembling that of *Limax*, radula like *Helix*, and a terminal slime-gland accentuated by a short deep groove extending backward on each side from it. It is in the Senckenbergian collection. — (*Jahrb. deutsch. mal. gesellsch.*, i. 1883.) w. h. d. [900]

Crustaceans.

Metamorphosis of Penaeus. — Walter Faxon calls attention to the fact that Fritz Müller did not keep the supposed *Penaeus* nauplius under observation until it changed to a protozoa, as is stated by W. K. Brooks in his recent account of the metamorphosis of *Penaeus* (*Johns Hopk. univ. circ.*, Nov., 1882), and that, consequently, the rearing of the protozoa to the young *Penaeus* by Brooks proves nothing new in regard to the relation of Müller's nauplius to *Penaeus*. Faxon, however, sees no good ground for refusing to accept Müller's reasons for believing his nauplius and zoea stages to be parts of one life-history. — (*Amer. nat.*, May, 1883.) s. i. s. [901]

Copepoda living in mollusks and ascidians. — C. W. S. Aurivillius has investigated the Copepoda inhabiting mollusks and ascidians on the Swedish coast, and published the results in two papers illustrated with seven double plates. Only two species, both belonging to the Sapphirinidae, were found inhabiting mollusks, — a species of *Lichomolgus* on species of *Doris*, and a new genus and species (*Modiolicola insignis*) upon the branchiae of *Modiola* and *Mytilus*. Twenty-one species, representing seven genera and five families, were found in the branchial sacs of ascidians, two new species being added to those already described by Thorell and others. Nearly all the old species are redescribed, and a large part of them figured, and analytical tables of the genera and species given. — (*Öfvers. vet. akad. förh.*, 1882, Nos. 3 and 8.) s. i. s. [902]

Insects.

Life-histories of American butterflies. — W. H. Edwards continues his careful and valuable descriptions of the early stages and habits of different American butterflies, giving us lately those of *Grapta comma*, *G. interrogationis*, and *Pyrameis Atalanta*. The descriptions of the caterpillars lose part of their value through lack of sufficiently explicit statement of the precise location of the dermal appendages. — (*Can. ent.*, xiv. 189, 201, 229; xv. 14.) [903]

Natural history of the fig-insects. — The very singular little group of fig-dwelling hymenoptera, referred by Westwood to the Chalcididae, is the subject of a recent monograph by Dr. Paul Mayer. Fig-growers have for ages taken advantage of the habits of *Blastophaga grossorum* for cross-fertilizing the tame fig with the wild caprificus. Mayer describes the anatomy of this species and some others, and discusses the geographical distribution of all known species, and their relations to the species of *Ficus* and its allies. The amount of adaptation induced by the peculiar habitat of the fig-insects varies in different

genera, the least abnormal forms being South American. The two sexes often differ enormously; the male of some forms losing wings, mouth, and ocelli, and having eyes and antennae of small size. — (*Mittheil. zool. stat. Neapel*, iii. 551, pl.) E. B. [904]

(*Economic entomology.*)

The pine moth of Nantucket.—Detailed accounts of the different stages, except the egg, and of the habits of *Retinia frustrana* Scudd., are given by S. H. Scudder. The paper is illustrated by an excellent chromolithographic plate. The author is inclined to believe the insect described under the same name by Comstock (*Rep. U. S. dep. agric.*, 1879) is specifically distinct. — (*Pub. Mass. soc. prom. agric.*, 1883.) J. H. C. [905]

The spruce Tortrix.—The natural history of *Tortrix fumiferana* Clem. is given by C. H. Fernald. (*Ann. rep. st. coll. agric. Maine*, 1882.) J. H. C. [906]

Clothes-moths.—A careful revision of the three species of *Tinea* which infest clothing has been made by Fernald. The common case-making species should be known by the name of *Tinea pellionella* Linn; the species which makes a gallery of the substance on which it occurs is *Tinea tapetzella* Linn; and the third species, which does not make a larval case, but webs together portions of the substance upon which it feeds into a cocoon before changing to a pupa, is *Tinea bisselliella* Hum. — (*Ann. rep. st. coll. agric. Maine*, 1882.) J. H. C. [907]

VERTEBRATES.

(*Physiology.*)

Development of the red blood-corpuscles.—Feuerstack has published a memoir on this subject. He gives first a brief mention of those authors who have sought to trace the development of the red corpuscles from the white; second, an abstract of Hayem and Pouchet's theory of the hæmato blasten; third, of other views of less importance. The author then presents his own observations and conclusions. "We find in the circulation of animals with nucleated blood-corpuscles every possible transition between colorless and colored blood-corpuscles. That they are transition stages from the white to the colored cells is shown by the course of development during artificially induced blood-formation." The principal places of formation in the pigeon are the osseous medulla, the spleen, the portal system, and the feather-shafts; in the frog, the bony medulla and spleen; in Triton, the spleen, and the lymph sinus near the bladder; in the eel, the spleen and the venal lymph sinus. (The author has overlooked the view, which is the one most plausible to us, that the colored corpuscles are merely nuclei, and not complete cells. His observations seem far from having settled the problem.) — (*Zeitschr. wiss. zool.*, xxxviii. 136.) C. S. M. [908]

Structural changes in the liver, accompanying functional activity.—This subject, which as yet has been little worked at in comparison with the numerous corresponding researches made on other glands of late years, is the subject of an interesting research by Afanassiew. His work leads him to the following conclusions: 1°. Both glycogeny and the formation of bile take place in all the cells of a liver-lobule. 2°. Agencies (section of the liver-nerves or feeding on albuminous diet) which increase the secretion of bile bring about a marked increase in the size of the hepatic cells, which are also seen to contain, in the interspaces of their protoplasmic network, numerous albuminous granules. The cell

limits are distinct, and the nuclei large and granular; the whole organ is firm and resistant. 3°. On feeding so as to get a liver exceptionally rich in glycogen, the cells are found to be enormously large, when compared with those of an unfed animal, their contours sharp, and in the cell body so many amorphous glycogen particles deposited as to compress the proper cell-substance into a mere coarse network stretching from the nucleus towards the periphery. The blood-capillaries are considerably narrowed by compression from the neighboring cells. The whole liver is soft and brittle. 4°. Toluyl-di-amine, which had been found by Schmiedeberg to produce jaundice, causes an increased biliary secretion. This it does by bringing about a great destruction of red blood-corpuscles, whose decomposition products stimulate the liver, and provide material for increased gall-secretion. The experiments were made on dogs. — (*Pflüg. archiv*, xxx. 385.) H. N. M. [909]

ANTHROPOLOGY.

Ethnography of the Caucasus.—In a summary of work by the Russian geographical society, *Nature* has the following language: "Several linguists consider the Armenian language as decidedly belonging to the Iranian group, while others classify it with the European group. Lagarde distinguishes it in three elements, — the Haikan, the Arkasid, and the Sassanid elements. The two latter are Iranian; but the Haikan elements belong to a family of languages the oldest of which is the Zend. Hülschman concludes that it occupies an intermediate place between the Iranian languages and the Slavo-Lithuanian; and Fr. Müller, a partisan of its Iranian origin, admits that it has some kinship with the Slavo-Lithuanian languages. Prof. Patkanoff concludes that it occupies an intermediate place between these two, and is a representative of an extinct group of Indo-European languages, which formerly was spread, perhaps, in Asia Minor." — (*Nature*, March 15.) J. W. P. [910]

Tribes of the Zambesi.—Père Depelchin, leader of the catholic mission on the Zambesi, reports the following tribes along that river, near its confluence with the Chobe: the Ma-Nansa (or Ma-Kalaka), Ma-Laya, Ma-Shukulombwe, Ma-Shubia, Ma-Totala (identified with the Ba-Nyeti), Ba-Rotse (or Ma-Rotse), Ma-Ntchoia, Ma-Mbunda, Ba-Libale, Ma-Pingula, Ma-Hes. These tribes are subject to the empire of the Ba-Rotse. Père Depelchin finds that in Holub's lists the vernacular terms for professions had been entered as the names of separate tribes. The traveller also corrects some difficulties respecting the languages of the tribes. — (*Precis hist.*, Feb.) J. W. P. [911]

Iron in the Ohio mounds.—Mr. F. W. Putnam showed that the iron swords, and plate of cast iron, referred to in the writings of Dr. Hildreth and Mr. Atwater as found in mounds at Marietta and Circleville, never existed. The light shed by recent discoveries showed that the supposed sword-handle mentioned by Mr. Atwater, and the supposed ornaments of a scabbard described by Dr. Hildreth, were common forms of implements and ornaments from the mounds; while 'the iron rust in the copper tube,' or supposed 'end of the scabbard,' was red oxide of copper, and the tube itself was simply a copper bead of ordinary form. Mr. Putnam had studied the original specimens of Dr. Hildreth, which were in the cabinet of the Antiquarian society; and they will be illustrated in his paper, to be printed by the society. — (*Amer. antiq. soc.*; meeting April 25.) [912]

Voyages of Moncatch-Apé.—In reference to the recent notice of M. Le Page du Pratz (see 634),

and the bearded men on the Pacific coast in the beginning of the last century, Mr. A. M. F. Davis concedes the probability of the journey, but doubts the meeting with the bearded men. Although this region was not penetrated by explorers until Lewis and Clark crossed the continent in 1804, still the stories of the Indians bore uniform testimony to the river and the ocean; and there was more or less testimony tending to show the visitations of white men in ships. Such sources of information were open to Indian and Frenchman alike; and Mr. Davis attempts to show, that, upon the skeleton of the story of actual travel furnished by the Indian, Le Page du Pratz builds up the story, which he publishes with its details, as to the bearded men. He finds two endings to the story, — one published in Dumont; the other, in Le Page's own book, — both credited to Le Page. In the later publication of the two, Mr. Davis fancies that he can trace in the changes evidence of knowledge derived from the Bering's expedition, and from publications of the period, which were given to the world about that time. In conclusion, he hopes that no opportunity will be lost to search oriental records, for upon them we must ultimately rely for the permanent disposal of such questions. — (*Amer. antiq. soc. ; meeting April 25.*) [913]

Indians on the Beni River. — The Beni River has been explored from time to time: for instance, by Palacios and by Bursa in 1846, by Lieut. Gibbon in 1852, by Prof. Orton and Ivon D. Heath in 1877, and by the Cura Serabia in 1879. Dr. Heath gives the following note on shirt-making: "Some of the men took time, while stopping for breakfast, to make new shirts. A young Brazilnut-tree of the proper size being found, the bark is stripped off to a height of eight to ten feet. This is taken to the river, placed on a log or stone, and beaten with a stick. When free from outer bark, the fibres are opened, and form a good cloth. This is then folded in the middle, a space left for the arms, the sides sewed down to near the bottom, and a slit cut for the head. When old, these shirts are as soft as old linen." In the journey down the Beni River, Mr. Heath encountered the Tacanas, Cavinás, Pacavaras, Araunas, and Mobimas. The most interesting result of Dr. Heath's anthropological researches is the account of a series of pictographs on the rocks at the falls and rapids of the rivers Madeira and Mamoré. Illustrations of these carvings are given. — (*Bull. Amer. geogr. soc.*, 1882, no. 3.) J. W. P. [914]

Nomenclature of crime. — In a pamphlet by F. H. and W. B. Wines upon the nomenclature of crimes in the United States as an aid to the tabulation of the statistics of crime, the authors have endeavored to collate all offences punishable in the United States under any statute enacted either by the national congress, or by the legislature of any one of the states. Without a knowledge of the laws under which commitments to prison are made in the several states, the statistics of imprisonment are valueless for all purposes of intelligent comparison. The offences enumerated are divided into five classes, as follows: —

I. Offences against the government. 1. Against the existence of the government; 2. Against the operations of the government, — *a.* Currency, *b.* Election laws, *c.* Postal laws, *d.* Revenue; 3. Against international comity.

II. Offences against society. 1. Against public health; 2. Against public justice; 3. Against public morals; 4. Against public peace; 5. Against public policy.

III. Offences against the person.

IV. Offences against property.

V. Offences on the high seas.

The index to this pamphlet covers 59 pages, and is a necessary guide to the contents of the work. — J. W. P. [915]

The archeology of the District of Columbia.

— Dr. J. Meredith Toner, in 1874, founded a medal in Georgetown college, D.C., "to encourage among the students habits of inquiry, and the development of the faculty of close and accurate observation, not only of the rarer phenomena of nature, but of the commonest things met with in daily life." At the commencement in 1882, the successful candidate was Louis A. Kengla, who prepared an essay, now printed under the title of 'Contributions to the archeology of the District of Columbia.' The young author enters minutely into localities and classes of implements, and has furnished a good map and five full-page plates of illustrations. The work does credit alike to the writer and to his generous patron. — J. W. P. [916]

Natives of Borneo. — Some addition to our knowledge of the inhabitants of Borneo and the Sulu Islands is made by Mr. W. B. Preyer, the British North-Borneo company's resident, at Elopura. The inhabitants of the Sulu Islands are divided into Sulus (Malays, with Arab and Chinese blood) and Bajaws, or seagypsies. These are described at length, both as to their physical and their moral characteristics. On the coast-line of Borneo is an extraordinary mixture of people, — Sun-Dyaks, Malays, Javanese, Sulus, Bajaws, Bugis, Chinese, Arabs, Klings, and many others; while of the Buludupies, the indigenous inhabitants of the district, there are hardly any of pure blood left. Allusions are made to slavery, religion, marriage, head-hunting, 'summing-up,' and disease. Mr. Preyer tells a very good story about marriage among the Datos. When a Dato of any consequence marries, he settles upon his bride a dowry of so many slaves, male and female, so many pieces of T. cloth, of silks, chintzes, and sarongs, etc. A house is built for her, and she is settled comfortably. At the end of a few months, the Dato goes off elsewhere, and repeats the process. The abandoned wife goes to work, with her capital and her slaves, to better her condition. Some fine day the Dato sails back to find in every port a house, a wife, and surroundings all comfortable and ready. — (*Proc. roy. geogr. soc.*, Feb. 7.) J. W. P. [917]

EGYPTOLOGY.

Serbonis. — In "The Hebrew migration from Egypt, an historical account of the Exodus, based on a critical examination of the Hebrew records and traditions," by J. Baker Greene, second edition (London, Trübner & Co., 1883), on p. 69, we are told, "In ancient times, if we may trust the evidence of historians, a sheet of water existed on the south side of Mount Casius, and separated by a well-defined but narrow strip of land from the Mediterranean Sea. . . . This was the Serbonian Lake. . . . This lake no longer exists. It has been filled by the drifting sands of the adjoining desert." In a work that makes so much pretension to impartiality and search for truth, egregious errors like this ought to be shunned. The best map yet published of Egypt and the Isthmus of Suez (that in Napoleon's Description de l'Égypte, Paris, 1809-1828) gives the length of Serbonis as a hundred kilometres, and its usual width as eight to ten kilometres. Mr. Greville Chester, in the volume of Special papers issued by the Palestine exploration fund, 1881, has given a very full description of the

lake, with its bright, sparkling waters, free from marine vegetation of any sort.

Mr. Greene also says (p. 76), "The evidence of travellers does not, however, support the suggestion that the Red Sea is remarkable for an excessive supply of seaweed." From Ehrenberg, 'Die korallenbänke,' 1832, to the last and best authority on the Red Sea (Klunziger, Upper Egypt, 1878, pp. 345-376), we are assured of the direct contrary of Mr. Greene's assertion. "A celebrated plant is the shora (Avicennia

officinalis), which forms large, dense groves in the sea, these being laid bare only at very low ebb. . . . The sea-grass meadows (*gisua* of the Arabs), which we have already often mentioned, and which are met with partly in depressions in the surface of the reef, partly on the bottom of the sea (especially in harbors), afford concealment to a special class of fishes, many of which are distinguished by possessing a green color." — (Klunziger, pp. 240, 376.) H. O. [918]

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

PUBLIC AND PRIVATE INSTITUTIONS.

Boston society of natural history.

The collection of minerals. — The society has just finished the arrangement of its collection of minerals with the express purpose of offering it as an illustration of the mode of arrangement to be adopted throughout their museum. The curator's report, shortly to be printed, has a detailed account of the collection, from which we give the following account: —

The exhibition is divided into three parts: I. Comparative mineralogy; II. Synopsis of classification; III. Systematic collection.

I. Under the head of comparative mineralogy, the following topics are treated by means of series of specimens: 1°. Composition and chemical relations of minerals; 2°. Form and structure of minerals; crystallography; 3°. Physical properties of minerals.

1°. Under the first head, such subdivisions as the variation of minerals in composition are dealt with in the cases by the exhibition of several selected series, — (a) variations due to original mixtures; (b) variations due to decomposition and alteration; (c) variations due to chemical substitution. The first (a) of these sub-topics, for example, is exhibited in a series of seven minerals. Three of these are varieties of amphibole, and display the distinct colors and aspect due to changes in the chemical composition of the varieties. The second (b) is shown by five minerals, among which are orthoclase and wernerite, — quite distinct substances, but which are undergoing reduction by decomposition to the same mineral, kaolinite. In the third (c) only one substance, phyrrotite, and its elements, sulphur and iron (which are placed together upon one tablet), is set apart for the exposition of the differences which may exist between the elementary constituents of a mineral, and the compounds resulting from their union.

The relations of water in the composition of minerals is dealt with in a series running from a strictly anhydrous hematite to natron (hydr. carb. sodium), having 55 per cent of water. There are twelve specimens in this series, and behind each specimen a tube exhibits the relative proportion of water.

2°. Form and structure presented no very serious difficulties beyond the need of finding persons capable of making the special models which were required. This was satisfactorily accomplished after some delay.

3°. As examples of the methods pursued in illustrating the physical properties of minerals, we can use the following: —

(a) The density series, showing the range of minerals in specific gravity. This series consists of twenty-seven minerals, including gold, which is twenty-one times heavier than water, and petroleum,

which is lighter than that standard liquid. This gradation is made apparent to the eye by means of glass tubes containing equal weights of each of the substances, reduced in the case of solids to a fine powder. Thus gold, with specific gravity 19.5, the heaviest substance, has necessarily the shortest, and petroleum, with specific gravity .75, the longest, tube; and the intermediate tubes show the gradations between these. Thus a series is formed which exhibits clearly that the volume of minerals is inversely proportional to their specific gravity or weight.

There are a number of series showing the relations of minerals to light, among which we may select, by way of illustration, that of the color test, or streak, of minerals.

(b) Streak series: lustre metallic, and color mainly essential. This label stands at the head of nine specimens, each mounted upon the same block, with a piece of novaculite of uniform size, such as is used to try the streak of minerals, partly covered with a band of the powdered mineral.

(c) Streak series: lustre non-metallic, and color non-essential except when white. This label is at the head of a precisely similar series, but consisting of eighteen minerals with their accompanying stones, exhibiting the great contrast between the color of minerals themselves and of their streaks upon the white surfaces of the novaculite.

(d) There are also series of specimens showing the principal minerals which exhibit electrical properties either in their natural conditions, or only when acted upon by friction or heat.

(e) Even the taste, touch, and odor of minerals are illustrated by similar series. Though persons cannot imagine how a rare mineral tastes, feels, or smells simply from the sight of it, they all know some of the commoner minerals of the same series which are placed on exhibition. With the guidance of the collection, they can also more easily duplicate the specimens, and understand their relations.

II. In the synoptical collection, the more important and abundant elements are here repeated, and each shelf is devoted to one of the grand divisions of the mineral compounds. Each division of minerals is represented by its most characteristic species; and the subdivisions of the anhydrous and hydrous groups are indicated on the labels, wherever these occur.

III. The systematic collection begins with the native elements, which occupy one wall-case next to the synoptical collection. This is followed by the compounds. These fill the wall-cases on the remaining sides of the room; and here are exhibited the different species of minerals arranged in their proper order as classified by Professor Dana, with some slight changes in the succession of the larger divisions.

Models of the principal or most characteristic crys-